

Rohilkhund streams,—the Ramgunga, Dojora, and Gurrah. It prefers sand-banks to mud, and is frequent in pools left by the falling waters. I have taken it also in the Jumna, Ganges, Bhaghiratty, and Goomty. It varies in colour from pale green to bluish green and olive.

The Assam species *Unio Corbis*, nobis, attains the size here recorded. With the exception of one small specimen, my examples are odd valves.

Long. 21, lat. 32, diam. 18 mill.

Another distinct species, of which I have a single valve, received from Major Rowlatt, inhabits Assam.

Unio bilineatus, Lea, I consider, as stated above, to be the very young of *U. marginalis*, Lk. Wherever the numerous varieties of the latter shell are found, from Delhi and Rohilkhund to Calcutta, the *bilineatus* form accompanies it, gradually altering, as the shell increases in size, into the regular type. The most beautiful variety of *Unio marginalis*, with a thicker shell and teeth, and with a fine salmon-coloured nacre, occurs in the Ramgunga, near Moradabad. At Calcutta, the species varies considerably in form, even in the same water. A salmon-nacred shell, sent by Dr. Day from Cochin, on the Malabar coast, apparently identical with the Chinese *U. consobrinus*, Lea, has the same form of young. In fact, the young of several species of *Unio*, of the *favidens* and *cæruleus* types, are disposed to be straight-hinged, as well as that of Gould's *U. Tavoyensis*, which closely approaches the young Siamese shell described by Lea as *U. Nucleus*.

P.S. *U. crispisulcatus*.—The sculpture is very like that of *Mya rugosa*, as figured by Chemnitz, t. 170. f. 1649; but the form of the posterior portion of the shell differs from that of the Coromandel species. The cardinal teeth are altogether different from those of the figure of "*rugosa*" in the 'Encyclopédie,' pl. 248. f. 6.

Cheltenham, Aug. 7, 1862.

XX.—Notes on some Chinese Condiments obtained from the Xanthoxylaceæ. By W. F. DANIELL, M.D., F.L.S., Staff-Surgeon, Army Medical Staff, &c.

[Plate V.]

I. Chinese or Japanese Pepper (*Xanthoxylum piperitum*, DC.).

AMONG other articles of food vended in the grocers' shops of the various provinces of the Chinese empire, may be enumerated collections of small dried fruits, consisting of dehiscent capsules

or carpels of a plant belonging to the natural order Xanthoxylaceæ. These fruits are employed as a condiment not only by the inhabitants of the Japan islands, but also by those of China. In consequence of their exportation from the sea-ports of the former, they have received the designation of Japan pepper; but, so far as their predominant use extends, they may with equal propriety merit the corresponding term of Chinese pepper. The name by which it is known throughout the latter country is that of *Hwa-Tseaou*. With reference to the source of this product, we have hitherto possessed but scanty information. Mr. D. Hanbury has recently stated that the supply of the Chinese shops was exclusively derived from the *Xanthoxylum alatum*, Roxb.* This statement, however, does not appear to be correct; on the contrary, so far as my researches reach, it is the produce of quite a different species, viz. *X. piperitum*, DC. (*Fagara piperita*, Linn.). During the recent war in Northern China, this plant was frequently observed under cultivation along the line of march from the mouth of the Peiho to Hang-chow. Isolated trees might be noticed growing on the native farms or clearances on the banks of the river, from Taku to Tien-tsin. It was also found under culture in several of the gardens in the villages of Sinho, Taku, &c., in the vicinity and in the court-yards of a few of the yamuns in Tien-tsin, and in one or two of those in the town of Peitang. The general habit of this species is that of a bushy tree of moderate growth, about 15–20 feet in height, with compact, flexuose, prickly branches, flowering in June and July, and densely covered, when the fruit ripens in October, with numerous corymbose expansions of deep-red berries. In this latter condition it presents a very ornate aspect, and can readily be distinguished in this respect from the circumjacent shrubs, bearing in the distance a close resemblance to the *Cratægus oxyacantha*, or Hawthorn-tree of Europe. In October and November, the people in the suburbs of Tien-tsin were engaged in gathering the ripe capsules for winter use; and with the view, therefore, of ascertaining whether they were identical with the dried article exhibited for sale in the local markets, I was induced to take the fruit-bearing branches to different shopkeepers of the towns, who without hesitation pronounced them to be the same. Upon comparison, no difference could be detected either in quality or flavour. That this species is known in other parts of China may be inferred from the circumstance of several of the Coolie corps from the southern provinces, attached to the expeditionary force, collecting the fruit for their daily meals, whenever an opportunity offered. From its wide distribution, it is probable that several varieties of this product

* Pharmaceutical Journal, ser. 2. vol. ii. p. 553.

may exist, one of which (marked by broader leaflets, a paniced inflorescence, and few, if any, spines) was sometimes brought for sale to the markets of the southern Taku Fort. I was informed that the inhabitants in the maritime and other districts of Petchili often plucked the immature fruit both for use and commerce.

Although the Xanthoxylaceæ are to be met with more or less abundant throughout the tract of country that embraced the seat of war, I nevertheless failed to discover the *X. alatum*, which, if it had constituted the ordinary source of the condiment of the population of Northern China, would have been placed under cultivation: such, apparently, is not the fact. This pepper, independently of its consumption as a spice, has been supposed to possess certain medicinal properties, and to act as an antidote against poisons. It is, however, never retailed in the drug-shops as a medicine, but only in those dépôts where various kinds of food are submitted for purchase. Taking into consideration the preceding data, I can only arrive at the conclusion that the mercantile article denominated Chinese pepper, exported from various provincial sea-ports, is in a great proportion procured from the *X. piperitum*, DC.

II. *Anise Pepper* (*Xanthoxylum Mantchuricum*, Benn.).

Scattered among the oak (*Quercus Mongolica*, Fisch.; *Q. obovata*, Bge.), mulberry (*Broussonetia papyrifera*), and other trees that fringed the outskirts of the Tuns, or native hamlets, in the neighbourhood of Taku-shan (a small village on the eastern side of Talie-whan, in Mantchuria) were a number of arborescent shrubs or young trees, whose corymbose inflorescence, imparipinnate foliage, and widely-spreading branches rendered them somewhat conspicuous objects in the botanical features of the locality. They afforded the usual characteristics of the Xanthoxylaceæ, and, from dried specimens of the plants submitted to the consideration of Mr. Bennett, have been determined by him to be a new species, which will be subsequently described in this paper under the name of *X. Mantchuricum*. This production may be distinguished from the preceding species by the more erect and tapering trunk (10–20 feet in height), divergent branches, expanded leaves, narrow and smaller pinnæ with fewer spines, the peculiar deep-pink hue of the pedicels and entire peduncle, but more especially by the remarkable anise-like flavour of the capsules. The plant flowers in May and June; and the fruits, which crown the summit in terminal corymbs, are at first green, but gradually change into a deep-red colour towards the end of September, when they attain maturity. The carpels, as they ripen, dehisce and display a

solitary, black, shining and slightly compressed seed, the singular appearance of a large number of which, when exposed at the same period, soon attracts the attention of the botanist. When dried, the carpels are one-third less in size, round or oval, wrinkled, pellucido-punctulate, and not roughly tuberculated as are those of the *X. piperitum*. The pericarp, however, in its unripe state, is studded with minute tubercular prominences, filled with an oleaginous secretion, that exudes on the slightest pressure, and to such a degree as to saturate the folds of paper in which the specimens were kept for preservation. The fruit, when eaten in its mature condition, is endowed with a pleasant sweetish taste and anise-like aromatic flavour, which, however, is dissipated to a great extent either by the process of exsiccation or by transmission to a colder climate. In aroma and other analogous qualities, it is much inferior to the seed-follicles of the *Pa-kioh*, or Star Anise tree (*Illicium anisatum*). By the inhabitants of the districts to which it is indigenous the fruit is apparently valued for its carminative and stomachic virtues; and although it enters into the composition of several of their dishes, it is also frequently administered as a remedial agent, under the form of a tea or infusion, for the relief of various visceral diseases.

III. *Star or Bitter Pepper* (*Xanthoxylum* (*Oxyactis*) *Danielli*, *Benn.*).

This species was discovered on a small promontory to the northward of the village of Taku-shan, adjoining a small joss-house or temple near its extremity. It in general assumed the character of a moderate-sized bushy tree, from 10–20 feet in height, except on the verge of the cliffs, where it became of more stunted growth, dwindling into low brush-like shrubs. The majority of the larger plants flourished on the borders of a field of *Sesamum* (*S. orientale*), where they had evidently been reared for some specific purpose. An essential difference in the peculiar disposition of the fruit, and the more luxuriant development of the foliage, was observed when placed in comparison with the preceding species. The imparipinnate leaves were also of larger growth, being from 1–1½ inch in breadth, and 2–3 inches in length, ovate, obtusely acuminate, and almost smooth. The branches were destitute of spines and less tortuous. The flowering occurred in June and July, in numerous corymbose panicles. The fruit consisted of a variable number of oblong or elongated capsules, arranged in stellate groups on a series of terminal panicles, which were at first of a deep green, but imperceptibly altering into a dusky-red colour as they advanced towards maturity, in September and October. The carpels are

8-10 lines long, and about 1-2 broad, dehiscing longitudinally into separate portions, and exposing to view two small, black, shining seeds. The epicarp was completely dotted over with tubercular receptacles or vesicles, containing a straw-coloured oil, or oleo-resin, which copiously oozed forth on any abrasion of its surface. The capsules have a peculiar aromatic odour, with a pungent bitter flavour and warm burning taste, that subsequently imparts to the palate a sensation of coolness when the air has been drawn into the mouth.

Although informed by the natives that these carpels were employed as a condiment, and also for certain medicinal and other economic uses, I was unable to obtain any precise statement illustrating their mode of appliance. That this and the anise-pepper are of some utility, may be inferred from the care taken in the preservation of the trees; for, owing to the great dearth of fuel, no brushwood of any kind is permitted to grow throughout the country, the inhabitants being reduced to the necessity of burning dried grass and the stalks of *Zea*, *Panicum*, and other Cerealia, to cook their food.

I am indebted for the specific distinctions and following botanical details to Mr. Bennett of the British Museum, who, with unvarying kindness, has embodied the whole in a concise descriptive account contained in the appended letter. He remarks, with reference to the application of the term *Xanthoxylum* to these Chinese species, that he so spells "the name in conformity with its etymology and with the practice of Smith, Sprengel, Martius, and Bentham, and in spite of the authority of Linnæus, Kunth, and DeCandolle, in favour of *Zanthoxylon*."

"Your specimen from Tien-tsin agrees perfectly with *Fagara piperita* of Linnæus, which is entirely founded upon the 'Teo and Tansjo' of Kæmpfer, to whose figure your specimen bears the most striking resemblance. This figure and the description which accompanies it, together with the very accurate character and description given by Siebold and Zuccarini in the 'Abhandlungen der Mathem.-Physikalischer Classe der K. Bayerischen Akademie,' iv. p. 137, leave no room for any addition. We have in the herbarium of the British Museum a miserable specimen from Kæmpfer himself, and a tolerable one from Thunberg, which entirely confirm the identification. I have some doubt with respect to your specimen from the Taku Fort, on account of the total want of prickles, the larger size of the leaflets, and the more ample and almost paniced inflorescence; but as it agrees in all other points, I am disposed to consider it only as a variety."

"You ask me whether this plant is the true source of the Japanese pepper; and of this I imagine there can be no doubt,

the authority of Kæmpfer, Thunberg, and Siebold being decisive on this point. But you mention *Xanthoxylum alatum* as having been so regarded. I know of no Asiatic species so called, with the exception of Roxburgh's (Flor. Ind. iii. p. 768), which appears in DeCandolle's 'Prodromus' under the name of *X. acanthopodium*, and differs very widely indeed from the Chinese and Japanese species by its strongly winged and strongly armed petioles, and by its very short and sessile axillary cymes. Its seeds (or, more probably, its capsules), as we learn from Roxburgh, are used medicinally; but this is doubtless the case with many of the species, on account of their peculiar taste and odour. The true Japanese pepper, however, must be that which is found in Japan, and which was originally described by Kæmpfer, and adopted from him by Linnæus*.

"Your Mantchurian specimen from Talie-whan is certainly distinct, and differs, I think, from all the species hitherto known. I characterize it as follows:—

"Xanthoxylum Mantchuricum.

"*X. aculeis sparsis v. infrapetiolariibus rectis conicis armatum, foliis sparsis imparipinnatis 5–9-foliolatis, foliolo terminali sessili, omnibus oblongo-lanceolatis utrinque attenuatis subsessilibus crenato-dentatis superne punctulis elevatis piliferis scaberulis cæterum glaberrimis, in crenarum axillis nec alibi in lamina pellucido-punctatis, corymbis terminalibus, coccis 1–3 punctulato-rugosis.*

"The differences between this species and *X. piperitum* are obvious from the character: they mainly consist in the narrower form of the leaflets, the slight scabrities of their upper surface, which I have not noticed in any other species, the entire absence of pellucid glands, except in the axils of the marginal crenatures, and the surface of the cocci, which, instead of being rudely glanduloso-tubercular, as in *X. piperitum*, are merely pellucido-punctulate and wrinkled. The common petioles, which are angular, are from 2 to 4 inches in length, and the leaflets from 8 to 10 lines long by 3 or 4 wide. This species I had at

* "Since I wrote to you on this subject, I have looked over Mr. Hanbury's paper in the 'Pharmaceutical Journal' for the present year (1861), and find that he speaks of the fruits of two species of *Xanthoxylum* as sold in the Chinese markets, the one the produce of *X. piperitum*, L., the other *X. alatum*, Roxb. The fruits of both species are remarkably similar in character; but I have not seen any specimens of the plant from China which can be positively identified as *X. alatum*. I have little or rather no doubt, however, of the identity of *X. alatum*, Roxb., and *X. acanthopodium*, DC. The specimens distributed by Dr. Wallich under the name of *X. alatum*, Roxb., agree in every particular with DeCandolle's character of *X. acanthopodium*; and the fragment preserved in the Indian herbarium of the Linnean Society, from Dr. Roxburgh's own collection, cannot be distinguished from them."

first, as you are aware, considered as identical with *Fagara Avicennæ*, Lam.; and, as far as the description of that plant goes, I see little to distinguish them, except the generally smaller number of leaflets and the little asperities of their surface; but as Mr. Benthams has, in his 'Flora of Hongkong,' identified Lamarck's plant with a totally different species, to which Lamarck's description is at least equally applicable, I adopt his determination without hesitation, and describe your plant as new. I may add to the synonyms of *X. Avicennæ*, DC. and Benth., the *X. clava Herculis*, Lour. nec Linn., as proved by Loureiro's specimen in the herbarium of the British Museum.

"Your other *Xanthoxylum* from Talie-whan is one of the finest and most remarkable species of the genus. Many botanists, I doubt not, would regard it as constituting a new and very distinct genus; but, taking into account the numerous transitional modifications of structure and the consequent phalanx of merely conventional genera that have already been formed at the expense of this extensive and polymorphous group, I cannot but agree with those who prefer to unite them all, or nearly all, under one generic name. I regard your plant, however, as offering sufficient characters to constitute a well-marked subgenus, and I am disposed to consider in the same light *Euodia* and *Boymia* (whether kept separate or combined), inasmuch as approximations to a valvate æstivation of the petals and superposed ovules are to be found in species having alternate as well as opposite leaves. If opposite leaves and superposed ovules were alone to be regarded, your plant would belong to the same division with *Euodia* (*Boymia* included); but as far as I am acquainted with the fruit of the other species, it differs from them remarkably in the form and arrangement of the cocci. I proceed, therefore, to give its characters as a subgenus, premising that I have seen only specimens with ripe fruit:—

"Gen. XANTHOXYLUM.

"Subgen. *Oxyactis*, Benn.

"*Cocci* 5 (rarius 4), stellatim dispositi, in valvulas 2 apice acuminatas dehiscentes, ideoque æqualiter 10- (8-) radiati. *Semina* 2, perfecta, superposita.

"*X. (Oxyactis) Danielli*. Pl. V. fig. 1.

"*X. inerme*, foliis oppositis imparipinnatis 5-9-foliolatis, foliolo terminali longius reliquis brevipetiolulatis, omnibus basi rotundatis ovatis obtuse acuminatis superne glabris inferne in nervis margineque puberulis obscure crenulatis nisi in crenularum axillis impunctatis, corymbis (fructiferis) folio brevioribus terminalibus divaricatis ramosis.

"The common petioles are from 3 to 6 inches long, rounded,

and perfectly smooth; the leaflets from 2 to 3 inches long, and an inch or more in breadth, rounded or slightly cordate at the base, the lower ones in pairs supported on petiolules of 2 to 3 lines long, while the terminal one has a petiolule of an inch in length; and the terminal corymb expands almost into a panicle. The combined fruit, after dehiscence, measures fully half an inch across. In some respects the plant appears to approach *Euodia meliæfolia*, Benth. = *Megabotrya meliæfolia*, Hance = *Boymia glabrifolia*, Champ., but differs widely in the character of the fruit, in the crenulate margin of the leaflets, and in the pubescence of their nerves, none of which characters are indicated in the several descriptions of the plant of Southern China. A northern plant, *Phellodendron Amurense*, Rupr. in 'Bull. Acad. St. Petersb.' and in 'Maxim. Prim. Flor. Amur.' p. 73, t. 4, also bears considerable resemblance in its habit, in the size and composition of the leaves, and in the form of the leaflets, but, if the fruit be correctly figured, is very different indeed."

EXPLANATION OF PLATE V.

Fig. 1. *Xanthoxylum (Oxyactis) Danielli*; leaf and inflorescence, two-thirds of the natural size.

Fig. 2. Separate carpella, of the natural size.

Fig. 3. Seeds, of the natural size.

XXI.—On some additional Species that are common to Carboniferous and Permian Strata; with Remarks on the Recurrency of Carboniferous Species. By JAMES W. KIRKBY.

[Plate IV.]

IN a former paper, where I noticed the occurrence of a Permian *Lingula* in the Durham Coal-measures, a list was given of such species as were then known to be common to the Carboniferous and Permian life-groups*. Since the publication of that paper, Mr. Davidson has shown that some additional Brachiopods may be placed on the list of Carboniferous recurrences†; and the present communication is chiefly made for the sake of identifying three forms of *Entomostraca* and *Polyzoa* belonging to the Carboniferous series with species that have hitherto been considered exclusively Permian, and thus to still further increase the list of these recurrent forms.

The Carboniferous fossils were sent to me, along with others, by Messrs. H. W. Crosskey and J. Young, of Glasgow, from the

* Quart. Journ. Geol. Soc. vol. xvi. p. 415.

† Mon. Brit. Carbon. Brach. (Palæont. Soc.), pp. 265–268, pl. 54.